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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN STEPHEN DUNFIELD
and JAMES W. AYRES

Appeal 2008-5764
Application 10/765,402[1]
Technology Center 1700

Decided: December 22, 2008

Before CATHERINE Q. TIMM, MARK NAGUMO, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* NAGUMO.

Opinion Concurring-in-part filed by *Administrative Patent Judge* TIMM

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[1] Application 10/765,402, *Method of Making Microcapsules Utilizing a Fluid Ejector*, filed 27 January 2004. The Specification is referred to as the "402 Specification," and is cited as "Spec." The real party in interest is listed as Hewlett-Packard Development Company, LP, which is said to be a wholly owned affiliate of Hewlett-Packard Company, managed by HPQ Holdings, LLC. (Appeal Brief under 37 C.F.R. § 41.37 filed 31 October 2006 ("Br."), 1-2.)

NAGUMO, *Administrative Patent Judge.*

DECISION ON APPEAL

A. Introduction

John Stephen Dunfield and James W. Ayres ("Dunfield") timely appeal under 35 U.S.C. § 134(a) from the Final Rejection[2] of claims 1-30, 32-34, 39, 40, 46-57, 59-61, 66, and 67. The remainder of pending claims 1-72, i.e., claims 31, 35-38, 42-45, 58, 62-65, and 68-72, have been withdrawn from consideration and are not before us. We have jurisdiction under 35 U.S.C. § 6(a). We AFFIRM-IN-PART.

The subject matter on appeal relates to methods of making microcapsules. Representative Claim 1 reads:

Claim 1

A method of making a microcapsule, comprising:

[**a**] activating a fluid ejector at a frequency greater than 10 kilohertz, wherein

each activation of said fluid ejector generates essentially a drop,

said fluid ejector fluidically coupled to a first fluid including a core component;

[**b**] ejecting essentially said drop of said first fluid into a second fluid,

said drop having a volume; and

[**c**] generating a microcapsule in said second fluid for each drop of said first fluid ejected, wherein

said microcapsule includes said core component.

[2] Office Action mailed 31 May 2006 ("Final Rejection," or "FR").

(Claims App., Br. 26; square bracketed letters, paragraphing, and indentation added.)

Limitations of the remaining claims will be introduced with the discussion of those claims.

The Examiner has maintained the following grounds of rejection:

A. Claims 1, 2, 4-8, 11-14, 17, 18, 46, 47, and 49 stand rejected under 35 U.S.C. § 102(b) in view of Loughman.[3]

B. Claims 15, 16, and 19-28 stand rejected under 35 U.S.C. § 103(a) in view of Loughman.

C.† Claims 3, 9, 10, 48, and 50-55 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Loughman and Boucher.[4]

D.† Claims 29, 30, 32-34, 39, 40,[5] 56, 57, 59-61, 66, and 67 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Loughman and Wang.[6]

†Rejections over common references have been combined.

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[3] Thomas Ciaran Loughman, *Process for Making Absorbable Microparticles*, WO 99/38535 (1999).

[4] William R. Boucher, *Electronic Devices having an Inorganic Film*, U.S. Patent 6,641,254 B1 (4 November 2003), based on application 10/121,394, filed 12 April 2002.

[5] The Examiner's citation of claim 41 in the rejection (Ans. 11; FR 6) appears to be a word-processing error, as claim 41 has been withdrawn from consideration.

[6] Taylor G. Wang, *Semipermeable Microspheres Encapsulating Biological Material*, U.S. Patent 5,462,866 (1995).

Rejections over Loughman under § 102(b) and § 103(a)

Dunfield contends that the Examiner misinterpreted limitations [**a**] and [**c**] of claim 1 and erred in finding that Loughman teaches those limitations.

For the rejection of claim 1, the critical issue of claim interpretation is, what is meant by step [**a**], "activating a fluid ejector . . . each activation generat[ing] essentially a drop"? The critical issue of fact is: has Dunfield shown reversible error in the Examiner's finding that Loughman teaches producing essentially a drop of a first fluid including a core component that is encased in a microcapsule generated in a second fluid?

B. Findings of Fact

Findings of fact throughout this Decision are supported by a preponderance of the evidence of record.

The 402 Specification

1. According to the 402 Specification, current methods of microencapsulation generate a broad distribution of microcapsule sizes, which makes it difficult to dispense accurately an optimal drug dosage. (Spec. 2:8-10.)

2. Precisely controlled microcapsule size is therefore highly desired. (Spec. 2:16-27.)

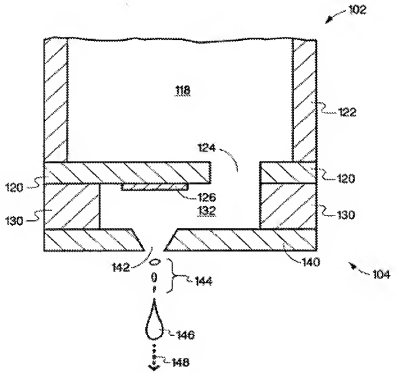
3. The present invention is said to accomplish this goal by using "a fluid ejection device to eject drops of a precise volume of a fluid, that includes a

core material component, into a second fluid" that microencapsulates the core material. (Spec. 3:19-22.)

4. The 402 Specification states that "[t]he present invention may utilize a wide variety of fluid ejection devices including both continuous and drop on demand types of fluid ejection devices." (Spec. 3:22-24.)

5. Thermally activated fluid ejection devices, piezoelectric, and acoustic activation devices are said to be examples of useful fluid ejection devices. (Spec. 3:24-26.)

6. A fluid ejection device **102** is said to be illustrated in cross-section in Figure 1a, which is reproduced below:



{402 Specification Figure 1a is said to show a fluid ejector.}[7]

[7] The text in curly braces following the Figures is provided to ensure compliance with section 508 of the U.S. Rehabilitation Act for publication

7. Fluid reservoir **118** contains a first fluid that contains a core material. (Spec. 4:19-21.) Reservoir **118** is connected via passage **124** to ejector head **104**, which comprises chamber **132**, defined by substrate **120**, chamber layer **130**, and nozzle layer **140**, which contains nozzle **142**. (*Id.* at 5:11-125)

8. Substrate **120** bears an energy-generating element or fluid ejector **126**, which is said to "create the force to eject essentially a drop of fluid held in chamber **132**." (Spec. 4:26-28.)

9. In the words of the 402 Specification, "[f]luid or drop ejector **126** creates a discrete number of drops of a substantially fixed size or volume." (Spec. 4:28-29.)

10. A thermal resistor, when used as ejector **126**, is said to rapidly heat a component in the fluid above its boiling point, vaporizing the fluid component, and resulting in the ejection of a drop of fluid. (Spec. 4:28-5:2.)

11. A piezoelectric element, when used as ejector **126**, is said to apply a voltage for to the fluid to generate a compressive force that ejections a drop of the fluid. (Spec. 5:2-4.)

12. The 402 Specification refers to a publication by Stephen F. Pond, *Inkjet Technology and Product Development Strategies* Ch. 4 (2000) [hereafter, "Pond"], for more details on transducers used in drop-on-demand fluid ejection cartridges, and to a publication in the Hewlett-Packard Journal for thermal inkjet devices. (Spec. 5:4-9.)

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of this Decision on the USPTO website pursuant to the Freedom of Information Act. It is not part of the Decision.

13. Neither publication appears to have been submitted to the record during prosecution of the 402 Application, and neither publication has been submitted in the Evidence Appendix of Dunfield's Brief on Appeal.

14. The term "drop-on-demand fluid ejection cartridge" is not defined in the 402 Specification, although several embodiments are described.

15. According to the 402 Specification, "[e]ach activation of a fluid ejector results in the ejection of a precise quantity of fluid in the form of essentially a fluid drop with the drop ejected substantially along fluid ejection axis **148**." (Spec. 5:21-23.)

16. "Each fluid drop may include primary drop 146 as well as possible secondary drops **148**." (Spec. 5:21-24.)

17. The 402 Specification refers to two publications in the Hewlett-Packard Journal for more information on drop formation. (Spec. 6:3-9.)

18. Neither publication appears to have been submitted to the record during prosecution of the 402 Application, and neither publication has been submitted in the Evidence Appendix of Dunfield's Brief on Appeal.

19. The record does not appear to contain a detailed description of drop formation by drop-on-demand ejectors or by continuous ejectors.

20. The general microencapsulation process of the invention is said to have three steps as illustrated in the flow diagram shown in Figure 3. (Spec. 8:11–10:14.)

21. The first step is described as a fluid ejector activating process **390**, which provides "the desired amount of energy that initiates the drop forming

process," where the amount of energy depends on the type of fluid ejector used. (Spec. 8:13-14.)

22. Thermal fluid ejectors, piezoelectric fluid ejectors, electrostatic drop on demand fluid ejectors, and acoustic fluid ejectors are characterized by the pulses each uses. (Spec. 8:15-21.)

23. Continuous fluid ejectors are said to use three different sets of pulses, "a low-power pulse for charging each nozzle through which drops are ejected, a periodic pulse of moderate power to synchronize drop break up, and a low power higher voltage pulse to deflect the fluid drops." (Spec. 8:21-24.)

24. The second step in the microcapsule formation process is said to be a fluid drop ejection process **392**, which generates "the force to eject a drop of fluid from a nozzle." (Spec. 8:28-29.)

25. Thermal and piezoelectric fluid ejectors are characterized as causing "ejection of a drop of the fluid" (Spec. 9:1-5.)

26. In contrast, a continuous fluid ejector is said to use a fluid "held under pressure in a chamber having a nozzle or bore to form a fluid jet that generally utilizes a piezoelectric vibrator attached to a wall of the chamber to generate the perturbation that causes the jet to breakup into drops." (Spec. 9:5-8.)

27. In the words of the 402 Specification, "[a]ny of these fluid ejector devices may be utilized in the present invention to eject a drop of a fluid that includes a core component or core material into a second fluid." (Spec. 9:8-10.)

28. The 402 Specification does not clearly define the difference between the fluid ejector activating process **390** and the fluid drop ejection process **392.**

29. The final step is a microcapsule generating process **394**, that can comprise, *inter alia*, a complex coacervation process in which water soluble cationic and anionic polymers interact to form the microcapsules. (Spec. 9:12-10:28.)

30. Several other methods of microcapsule generation are described (Spec. 11-12), including three examples (*id.* at 12-15), which, because they are presented in the present tense, we presume to be prophetic.

31. According to the 402 Specification, the injection of the drops into the second fluid can take various forms, including injection into still or moving fluid from an ejector that is above or inserted into the second fluid and that can be moved. (Spec. 11:20-25)

32. The second fluid may also take the form of a thin sheet or a mist. (Spec. 11:25-12:5.)

Loughman

33. Loughman describes methods of making encased bound microparticles having an absorbable polymer coating. (Loughman abstract.)

34. According to Loughman, "[b]ound microparticles are encased with an absorbable encasing copolymer of lactide and glycolide using coagulation of solid microparticles encased in a polymer solution and delivered through an ultrasonic atomizer (nebulizer) into a liquid medium that is a non-solvent for the encasing polymer." (Loughman p. 9, ll. 29-32.)

35. Loughman teaches that the probe nebulizes at a frequency of 12 to 36 kHz, preferably 34 to 36 kHz. (Loughman p.9, ll. 34-36.)

36. In Loughman's words, "[d]epending on the concentration of the polymer solution for encasing the microparticles, the number of the original bound microparticles in the encased microparticles can vary from 1 to several hundred with an average diameter of an encased microparticle ranging from 0.5 μm to 10 μm." (Loughman p.10, ll. 4-7.)

37. According to Loughman, the nebulized drops are collected in a stirred slurry of solvent and dry ice. (Loughman p.10, ll. 27-33.)

38. In an ordinary laboratory setting, the stirring would be generally horizontal (on a lab bench) and the ejection would be vertical (onto or into the stirred slurry).

C. Discussion

The burden is on Dunfield, as the appellant, to prove reversible error in the Examiner's rejections. *See*, e.g., *Gechter v. Davidson*, 116 F.3d 1454, 1460 (Fed. Cir. 1997) ("[W]e expect that the Board's anticipation analysis be conducted on a limitation by limitation basis, with specific fact findings for each *contested* limitation and satisfactory explanations for such findings.") (emphasis added). *See also, for example, In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.") (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)). Moreover, the regulations governing appeals to the Board

provide that "[a]ny arguments or authorities not included in the brief or a reply brief filed pursuant to § 41.41 will be refused consideration by the Board, unless good cause is shown." 37 C.F.R. § 41.37(c)(1)(vii). Claims not argued separately stand or fall with the representative claim. *Id.*

"To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently." *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997) (citation omitted). "To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, ..." *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (internal quote and citation omitted).

During prosecution, "the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification." *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). It is improper, however, to read limitations from preferred embodiments in the specification into the claims. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1369 (Fed. Cir. 2004)

Dunfield raises three major arguments that claim 1 is patentable. First, Dunfield argues that Loughman does not anticipate the subject matter of claim 1 because Loughman does not disclose activation of a fluid ejector that generates essentially a drop of fluid. (Br. 8-9.) Dunfield, however, has not come forward with direct argument supported by evidence or technical

reasoning that the "activation of a fluid ejector at a frequency greater than 10 kiloherz" recited in claim 1 does not read on the 12-36 kHz ultrasonic atomization described by Loughman. Dunfield argues that "Loughman clearly activates the nebulizer and continuously operates it at a frequency of 12-36 kHz in contradistinction to Appellants[']claimed invention where Appellants activate a fluid ejector at a frequency greater than 10 kHz." (Br. 9.) However, the 402 Specification defines the "fluid ejector activating process" as the provision of "the desired amount of energy that initiates the drop forming process." (Spec. 8:13-14.) This definition of activation is sufficiently broad that it covers the formation of drops from a jet that is provided "continuously" as well as processes in which drops are provided by an apparatus such as the one depicted in Dunfield's Figure 1. Moreover, Dunfield has not directed our attention to specific definitions in the 402 Specification or in the record of the term "fluid ejector." Thus, Dunfield's reliance on limitation [**a**], "activating a fluid ejector" (Br. 9-10), is insufficient, by itself, to distinguish Loughman.

Dunfield and the Examiner also dispute the meaning of the limitation, common to the independent claims, "essentially a drop." The Examiner (Ans. 15-16) is correct that the term "essentially a drop" is not necessarily limited to a single drop. However, Dunfield (Br. 6-8) is also correct that the term must be interpreted in light of the supporting disclosure. Our review of the 402 Specification persuades us that the term "essentially a drop," as used in the claims on appeal, means that each activation produces, generally, one primary drop and perhaps a small number of secondary drops. While there is some room for variation, a process that generally results in "many"

primary drops per "activation" is excluded from the scope of the claimed invention.[8]

Dunfield argues that Loughman does not provide essentially one drop per activation (Br. 8-9), citing definitions of the terms "spray" and "atomization" in the *Concise Dictionary of Chemical Technology*. Dunfield has not, however, submitted the relevant parts of that reference into the prosecution record or the Evidence Appendix to its principal Brief on Appeal.[9] Therefore, these arguments are not supported by evidence of record, and amount to little more than attorney argument. More importantly, however, Dunfield has not shown that each vibration in Loughman's apparatus results in a plurality of drops that is outside the scope of "essentially a drop." Indeed, the 402 Specification, after describing thermal, piezoelectric, *and* continuous fluid ejectors, teaches that "[a]ny of these fluid ejector devices may be utilized in the present invention to eject a drop of a fluid that includes a core component or core material into a second fluid." (Spec. 9:8-10.) In summary, Dunfield's argument that "if atomization is a process that continuously converts a bulk liquid into droplets thousands if not a much larger number of drops would typically be generated on activating an ultrasonic atomizer or nebulizer" (Br. 9), and the implication

[8] In the event that we have misunderstood the Examiner's position— or should the Examiner be persuaded by evidence of well-founded scientific and technical argument that the Loughman process in fact produces many drops per activation, we presume that the current rejection will be withdrawn.

[9] Similarly, the general dictionary definitions offered by Dunfield (Br. 8 n.27-29) and by our colleague in dissent, *post*, while suggestive, neither define nor stand as evidence of the way Loughman's apparatus works.

that this argument applies to Loughman are not supported by evidence of record.

Finally, Dunfield argues that Loughman does not disclose limitation [**c**], "generating a microcapsule in said second fluid for each drop of said first fluid ejected, . . ." (Br. 10). Dunfield (Br. 10) cites Loughman's statement that "the number of the original bound microparticles in the encased microparticles can vary from 1 to several hundred" (Loughman p.10, ll. 5-6), as evidence that Loughman discloses that "there are anywhere from 1 to several hundred core component drops encased in each microparticle" (Br. 11). This argument is not persuasive because Dunfield fails to cite or address the introductory phrase to Loughman's statement, which reads in full, "[d]epending on the concentration of the polymer solution for encasing the microparticles, the number of the original bound microparticles in the encased microparticles can vary from 1 to several hundred with an average diameter of an encased microparticle ranging from 0.5 μm to 100 μm." (Loughman p.10, ll. 4-7.) The complete statement indicates that single encased microparticles (i.e., the microparticles formed from drops that are ejected into the second fluid) can be formed that have a single solid microparticle (corresponding to the "core component" recited in limitation [**a**] of Dunfield's claim 1. Thus, Dunfield's contention that Loughman does not disclose a single encapsulated drop is contradicted by Loughman.

We conclude that the meaning of the activation step recited in limitation [**a**] of claim 1 does not distinguish the claimed process from the process described by Loughman. We conclude further that Dunfield has failed to establish reversible error in the Examiner's finding that Loughman

describes generating "essentially a drop" of a first fluid, and that each drop is encased in a microcapsule generated in the second fluid. Because claim 4 adds the limitation that the fluid ejector be activated n times, ejecting n drops of the first fluid into the second fluid, it follows that Loughman also describes the limitations of claim 4. We therefore AFFIRM the Examiner's rejection of claims 1 and 4.

We consider next the Examiner's rejection of claims 2, 46, and 47 as anticipated by Loughman. Dunfield contends that the Examiner erred because Loughman fails to disclose activating a drop-on-demand fluid ejector. (Br. 11.) More particularly, Dunfield appears to argue that the Examiner failed to give sufficient weight to evidence that the term "drop-on-demand fluid ejector" is a term of art that means "that a physical process is manipulated to momentarily overcome surface tension forces and emit a drop or cluster of drops." (Br. 12, citing Pond, *supra*, at 90.) The problem is that Dunfield, despite ample opportunity (Pond is cited in the 402 Specification at p. 5, ll. 4-7), has failed to make the relevant parts of Pond—or any other references cited in the 402 Specification—of record. Consequently, we have not been placed in a position, as reviewers of the record, to evaluate Dunfield's characterization of Pond or of the term "drop-on-demand fluid ejector." Faced with the task of assigning the broadest reasonable interpretation to the term, and being mindful that it is improper to read limitations from examples in the specification into the claims, we cannot say that the Examiner erred in declining to give arguments of Dunfield's counsel significant weight compared to the express functional requirement of the drop-on-demand fluid ejector recited in these claims. That functional requirement is that the fluid ejector generate essentially one

drop per activation. As we have already determined that Dunfield failed to prove reversible error in the Examiner's finding that Loughman provides such a fluid ejector, we determine here that Dunfield has not shown reversible error in the Examiner's determination that Loughman describes a microparticle generation process that meets the drop-on-demand fluid ejector limitation. We therefore AFFIRM the rejection of claims 2 and 47.

Claims 5 and 6 depend from claim 1, and along with claim 46, recite the further limitation that the volume of drops produced at steady state be within a specified range (10% or 6%) of a specified value. Dunfield argues that there is no reason to think that Loughman meets these volume limitations. (Br. 14.) The Examiner maintains, without explanation or citation to evidence of record, that the recited limitations on volume distribution are inherent. (Ans. 5.) To establish inherency of a property, it must be shown that that property is necessarily present. Our review of the portions of Loughman cited by the Examiner, as well as the 402 Specification, particularly Figure 1b, showing the drop volume distribution attributed to "conventional" drop-forming processes (Spec. 6:23-25), indicates Dunfield's arguments are well founded. *In re Marzocchi*, 439 F.2d 220, 224 (CCPA 1971) ("it is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain why it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement.") The Examiner has failed to carry the initial burden. Accordingly, we REVERSE the rejection of claims 5, 6, and 46.

Appellants argue that there is no disclosure that the ultrasonic atomizer applies an electrical pulse charging the nozzle through which the first fluid drop is ejected, nor any disclosure of deflecting drops with a voltage pulse as required by claims 12 and 13, which depend from claim 1. (Br. 14.) The Examiner maintains, without citing evidence of record or explaining the underlying rationale, that such charging and voltage pulsing are inherent. (Ans. 5.) Because the Examiner has failed to establish an adequate evidentiary basis for the conclusion of inherency, or to explain why one of ordinary skill in the art would have recognized that the charging and deflecting steps are necessarily present in the processes described by Loughman, we REVERSE the rejection of claims 12 and 13.

Finally, Dunfield contends that Loughman does not disclose one nozzle formed in a nozzle layer as required by claims 17 and 18 (Br. 14), and urges that this failure is sufficient to reverse the Examiner's rejection. Dunfield does not direct our attention to a definition of the term "nozzle layer" in the record that distinguishes the disclosure of Loughman from the claimed subject matter. In the absence of evidence that the term "nozzle layer" has a meaning to those having ordinary skill in the relevant arts, we give that term the broadest reading consistent with the specification. On that basis, Dunfield has failed to show reversible error by the Examiner regarding the presence of a nozzle formed in a nozzle layer in Loughman. We therefore AFFIRM the rejection of claims 17 and 18.

Dunfield does not raise separate arguments for the patentability of the other claims rejected as anticipated by Loughman. Accordingly, we AFFIRM the rejection of claims 7, 8, 11, 14, and 49.

The Examiner rejects claims 15, 16, and 19-28, which depend from claim 1, and, substantively, claims 50-55, which depend from claim 47, as obvious over Loughman.[10] These claims variously describe the condition of the second fluid (e.g., claims 15, 16, and 23 require that the second fluid be a thin film; claims 26-28 require that it be a mist); or specify motion of the ejector with respect to the second fluid (claims 21, 22, 24, 25, 52-55); or specify that the ejector be submerged in the second fluid (claims 19, 20, 50). Claim 51 specifies that the second fluid must flow in a direction perpendicular to the fluid ejection axis.

Dunfield contends that none of the limitations recited in the claims are taught or suggested by Loughman (Br. 22), and urges that the Examiner has failed to explain how the limitations are obvious in view of Loughman (*id.* at 23). The Examiner offers explanations why a person having ordinary skill in the art would have modified the process described by Loughman to obtain processes within the scope of these claims. (Ans. 8-9.) The problem is, with the sole exception of claim 51, the Examiner has not explained what teachings in Loughman or the general knowledge would have suggested the particular limitations recited in the claims to a person skilled in the art. It is not enough to point out that a person having ordinary skill in the art would have understood what the purpose of doing something would have been, or why that modification would have worked, or why it would have been advantageous. While it is true that it is improper to require that

[10] Although claims 50-55 are formally rejected over the combined teachings of Loughman and Boucher, substantively, the Examiner has not relied on any teaching of Boucher. We therefore address claims 50-55 in parallel with claims 19-22, 24, and 25, as did Dunfield (Br. 22-23). The disposition of these claims follows the formal rejection.

"motivation" be express in the prior art, there must still be a reason grounded in the prior art to make the modifications before requiring an applicant to come forward with "secondary considerations" indicative of nonobviousness. Here, with one exception, the Examiner has not explained what teaching in Loughman, or what problem addressed, would have suggested providing the second fluid as a thin film, or as a mist, or that the ejector be moved in some particular way with respect to the second fluid, or that the ejector be submerged in the second fluid. Accordingly, we REVERSE the rejections of claims 15, 16, 19-28, 50, and 52-55.

The limitation of the sole exception, claim 51, is that the second fluid must flow "in a direction perpendicular to a fluid ejection axis of the fluid ejection device." As the Examiner found (Ans. 11:1-2), Loughman teaches that the collecting slurry is stirred (Loughman p.10, ll.27-33). Making the unexceptional assumptions that the stirring is horizontal and that the ejection is vertical, the flow induced by the stirring is indisputably in a direction perpendicular to the fluid ejection axis. Dunfield has not offered any evidence to the contrary. Accordingly, we AFFIRM the rejection of claim 51.

Loughman and Boucher

Claims 3, 9, and 48 require that the fluid ejection device be a thermal resistor or that it be thermally activated. Claim 10 requires that the fluid ejection device be piezoelectric. The Examiner relies on Boucher for teachings of such fluid ejection devices, and argues that "[i]t would have been obvious. . . to have utilized the fluid ejector of Loughman with either a thermal resistor or a piezoelectric element in order to ensure sufficient force

is present to eject the first fluid, as taught by Boucher." (Ans. 7; *see also* Ans. 10, 5th para.) Dunfield urges that the Examiner has failed to show why a person having ordinary skill in the art would have modified the ultrasonic atomizer of Loughman with the thermal and piezoelectric energy generating elements taught by Boucher, when there is no indication in Loughman that there is any problem ejecting the first fluid. (Br. 16.) Dunfield urges further that Boucher, which is concerned with encapsulating and hermetically sealing sensitive chip circuitry in devices used in hostile environments, such as in inkjet printing heads that have corrosive fluids that can damage the circuitry, is non-analogous art. (Br. 19-20.)

Again, the Examiner has failed to show any real-world, practical reason arising out of the references to modify the atomizer disclosed by Loughman with thermal or piezoelectric energy generating elements mentioned in passing by Boucher. Accordingly, we REVERSE the rejections of claims 3, 9, 10, and 48.

Loughman and Wang

As the Examiner noted (Ans. 3), Dunfield did not argue substantively in its principal Brief on Appeal against the rejections of claims held obvious in view of the combined teachings of Loughman and Wang, which was set out in the Final Rejection (FR. 6-7 and 10-11). Nor did Dunfield take the opportunity in its Reply Brief[11] to explain the absence of such arguments in its principal brief and offer arguments in rebuttal. Accordingly, these claims stand or fall with the rejection of independent claims 1 and 47, from

[11] Second Reply Brief to Examiner's Answer under 37 CFR § 41.3? [sic: § 41.41] filed 2 July 2007 ("Reply Br.").

which they depend. As we have AFFIRMED the rejection of claims 1 and 47, we summarily AFFIRM the rejection of 29, 30, 32-34, 39, 40, 56, 57, 59-61, 66, and 67.

D. Order

We AFFIRM the rejection of claims 1, 2, 4, 7, 8, 11, 14, 17, 18, 47, and 49 under 35 U.S.C. § 102(b) in view of Loughman.

We REVERSE the rejection of claims 5, 6, 12, 13, and 46 under 35 U.S.C. § 102(b) in view of Loughman.

We REVERSE the rejection of claims 15, 16, and 19-28 under 35 U.S.C. § 103(a) in view of Loughman.

We REVERSE the rejection of claims 3, 9, 10, 48, 50, and 52-55 under 35 U.S.C. § 103(a) in view of the combined teachings of Loughman and Boucher.

We AFFIRM the rejection of claim 51 under 35 U.S.C. § 103(a) in view of the combined teachings of Loughman and Boucher.

We AFFIRM the rejection of claims 29, 30, 32-34, 39, 40, 56, 57, 59-61, 66, and 67 under 35 U.S.C. § 103(a) in view of the combined teachings of Loughman and Wang.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

TIMM, *Administrative Patent Judge.*

While I agree with my colleague's interpretation of the claim language "essentially a drop," I reach a different conclusion with regard to the Examiner's finding of anticipation by Loughman.

In regard to the interpretation of "essentially a drop," I agree with my colleagues, and Appellants, that the Examiner interpreted this language unreasonably broadly (Br. 6). According to the Examiner, "essentially a drop" encompasses many drops because the Specification indicates that more than one drop is encompassed and, moreover, the transitional phrase "comprising" used in the claim allows the claim to encompass many drops (such as a million) (Ans. 15-16). On this basis the Examiner, finds that Loughman's ultrasonic atomizer or nebulizer generates "essentially a drop" with each activation of the fluid ejector as claimed (Ans. 4).

"'Essentially' means 'fundamentally.'" *Glaxo Group Ltd. v. Ranbaxy Pharmaceuticals, Inc.*, 262 F.3d 1333, 1336 (Fed. Cir. 2001) (quoting *Webster's Third New Int'l Dictionary* 777 (1986)).

Appellants' Specification, in concert with the meaning of "essentially" as "fundamentally," discloses that

> Each activation of a fluid ejector results in the ejection of a precise quantity of fluid in the form of essentially a fluid drop with the drop ejected substantially along fluid ejection axis 148. Each fluid drop may include primary drop 146 as well as possible secondary drops 144.

(Spec. ¶ [0013].)

This drop generation is depicted in Figure 1a as a single large drop (146) followed by some smaller secondary drops (144).

Figure 1a is reproduced below:

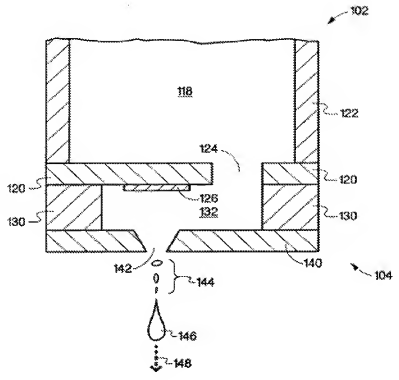

Figure 1a "is a cross-sectional view of a fluid ejection device" (Spec. ¶ [0004]).

The claim language "essentially a drop," read as broadly as is reasonable and in light of the Specification as that phrase would be interpreted by one of ordinary skill in the art, means that each activation generates a single drop, i.e., a primary drop (e.g., primary 146 shown in Fig. 1a), although it may also generate some smaller secondary drops (e.g., drops 144 shown in Fig. 1a).

While claim 1 uses the transitional phrase "comprising," the claim specifically limits the activating step to generating "essentially a drop". While "comprising" opens the claim to additional steps, the step of activating remains limited to what it recites. *See Kustom Signals Inc. v. Applied Concepts Inc.*, 264 F.3d 1326, 1332 (Fed. Cir. 2001)("The open-

ended transition 'comprising' does not free the claim from its own limitations.").

Contrary to the determination of the Examiner, claim 1 is limited to activating a fluid ejector such that each activation generates fundamentally a single drop, i.e., one primary drop and possibly a small number of secondary drops.

Loughman describes generating drops using an ultrasonic atomizer or nebulizer. The Examiner has not established that such an atomizer or nebulizer generates "essentially a drop," i.e., fundamentally a single drop, with each activation of the fluid ejector. In fact, nebulizers and atomizers are commonly understood to produce a spray of fine drops. (See "nebulizer" and "atomizer", Dictionary.com. *Dictionary.com Unabridged (v 1.1)* Random House, Inc. (2006), defining "nebulize" as "to reduce to a fine spray; atomize." (origin 1870-75) and "atomizer" as "an apparatus for reducing liquids to a fine spray" (origin 1860-65)). A spray may include a great many drops upon each activation.

In my view, the Examiner has not demonstrated that Loughman "describes" within the purview of § 102, generating "essentially a drop" with each activation of the fluid ejector. *See In re Schaumann*, 572 F.2d 312, 317 (CCPA 1978) (In order to anticipate, a reference must identify something falling within the claimed subject matter with sufficient specificity to constitute a description thereof within the purview of § 102).

All of the rejections rely upon the same interpretation of "essentially a drop," a limitation within all the claims, and rely upon the Loughman in the capacity described above. None of the other references cure the deficiencies

of Loughman. Therefore, I would not sustain any of the rejections maintained by the Examiner.

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